Analysis of Inpatients with Ankylosing Spondylitis

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Abstract [**Objectives**] To examine the clinical status of inpatients diagnosed with ankylosing spondylitis (AS) and to provide an evidence-based foundation for subsequent clinical interventions. [**Methods**] A total of 353 patients diagnosed with AS and discharged from the Department of Rheumatology at Wuxi Traditional Chinese Medicine Hospital between January 2018 and December 2024 were collected through the database platform. Statistical analyses were performed on variables including gender distribution, traditional Chinese medicine (TCM) syndrome types, underlying diseases, concurrent infections, and organ involvement complications. [**Results**] Among the 353 patients, the male-to-female ratio was 1.89 ∶ 1. The predominant TCM syndrome types identified were liver-kidney deficiency syndrome and blood stasis obstructing collaterals syndrome. A total of 76.77% of the patients presented with underlying diseases, with hypertension, digestive system diseases, diabetes, and cerebral infarction being the most prevalent. The incidence of concurrent infections was 13.60%, primarily comprising urinary tract infections and pulmonary infections. Additionally, 32.29% of patients experienced organ involvement complications, with osteoporosis, interstitial lung disease, and renal insufficiency occurring most frequently. [**Conclusions**] The majority of inpatients with AS are male. TCM syndrome types predominantly exhibit characteristics of "deficiency in origin and excess in superficislity". There is a high prevalence of complications arising from underlying diseases and organ involvement complications. Clinically, it is essential to balance the treatment of the primary disease with the prevention and management of complications. Furthermore, individualized treatment plans based on TCM syndrome types should be developed to optimize the management of this chronic disease.

Key words Ankylosing spondylitis (AS), Clinical feature, TCM syndrome type, Underlying disease, Complication

1 Introduction

Ankylosing spondylitis (AS) is a rheumatic disorder of unknown etiology associated with human leukocyte antigen (HLA). It is characterized by sacroiliitis and chronic inflammation of the spine, often accompanied by varying degrees of multi-organ involvement. The disease is a prevalent condition within the Department of Rheumatology at Wuxi Traditional Chinese Medicine Hospital, representing 5% of inpatient cases. This study conducted a statistical analysis of TCM syndrome types, underlying diseases, concurrent infections, and organ involvement complications among inpatients with AS. The objective was to comprehensively assess the clinical features of these patients in the rheumatology department and to inform the optimization of chronic disease management strategies.

AS is an autoimmune disorder primarily characterized by chronic inflammation of the sacroiliac joints and spine. Its onset is strongly associated with the human leukocyte antigen B27 (HLA-B27), and it frequently involves damage to multiple organ systems, significantly impairing patients' quality of life[1]. AS, a predominant disease within the Department of Rheumatology at Wuxi Traditional Chinese Medicine Hospital, constitutes 5% of the department's inpatient population. Nevertheless, the clinical features of these inpatients, the distribution of TCM syndrome types, and the patterns of complication occurrence have not been comprehensively analyzed. This study retrospectively examined the clinical data of AS inpatients over 7 years, with the objective of elucidating their clinical features and identifying factors influencing disease prognosis. The findings aim to inform the optimization of clinical diagnosis and treatment strategies, and chronic disease management protocols.

2 Materials and methods

2.1 General information A total of 353 AS patients admitted to the Department of Rheumatology at Wuxi Traditional Chinese Medicine Hospital between January 2018 and December 2024 were included in this study. The cohort comprised 122 females and 231 males, yielding a male-to-female ratio of 1.89 ∶ 1. All participants were confirmed inpatients with comprehensive clinical data available.

2.2 Diagnosis and inclusion and exclusion criteria for cases

2.2.1 Diagnostic criteria of Western medicine. The New York criteria, revised in 1984, or the diagnostic criteria established by the Assessment of Spondyloarthritis International Society (ASAS) in 2009 were utilized.

2.2.2 TCM syndrome differentiation criteria. According to the syndrome differentiation and classification standards for AS in the *Guiding Principles for Clinical Research of New Traditional Chinese Medicine Drugs* (*Trial*) 2002, AS is categorized into several syndrome types, including blood stasis obstructing collaterals syndrome, liver-kidney deficiency syndrome, rheumatic obstruction syndrome, damp-heat obstruction syndrome, and cold-damp obstruction syndrome.

2.2.3 Inclusion criteria. The inclusion criteria comprised patients who met the aforementioned diagnostic criteria of both traditional Chinese and Western medicine, were hospitalized in the Department of Rheumatology at Wuxi Traditional Chinese Medicine

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Hospital between 2018 and 2024 for treatment, and possessed complete clinical data that permitted effective follow-up and data extraction.

2.2.4 Exclusion criteria. The exclusion criteria were as follows: patients with suspected AS but an unclear diagnosis; patients with active tuberculosis; patients who experienced sudden severe cardiovascular or cerebrovascular events during hospitalization and were subsequently transferred out of the department; and patients with missing or incomplete clinical data.

2.3 Observation indicators The gender distribution of patients, TCM syndrome types, underlying diseases (including cerebrovascular diseases, cardiovascular diseases, heart diseases, thyroid disorders, respiratory diseases, digestive system diseases, neuropathies, *etc.*), types of concurrent infections, and organ involvement complications (such as interstitial lung disease, renal insufficiency, osteoporosis, *etc.*) were systematically observed and documented.

2.4 Statistical methods Data analysis was performed using SPSS 19.0. Enumeration data were presented as number of cases (%), and the *chi*-square (χ^2) test was employed to compare proportions between groups. Measurement data were expressed as mean ± standard deviation ($\bar{x} \pm SD$). Independent samples *t*-tests were utilized to compare means between groups. A *P*-value less than 0.05 was considered indicative of statistical significance.

3 Results and analysis

3.1 Annual changes in gender distribution Over the 7-year period, the gender distribution of AS inpatients demonstrated a pronounced male predominance, with males comprising 65.44% and females 34.56% of the patient population. This male predominance was consistently observed each year (Table 1). The highest number of male patients was recorded in 2019, with 52 cases, whereas 2024 exhibited the lowest total number of admissions, with 36 cases across both genders. The annual number of female patients remained relatively stable, showing no significant fluctuations.

Table 1 Gender distribution of AS inpatients from 2018 to 2024 case

Year	Female	Male
2018	15	37
2019	23	52
2020	20	31
2021	21	37
2022	14	27
2023	14	26
2024	15	21
Total//*n* (%)	122 (34.56)	231 (65.44)

3.2 Distribution characteristics of TCM syndrome types Among the 353 patients, the most prevalent TCM syndrome type was liver-kidney deficiency, observed in 123 cases (34.85%). This was followed by blood stasis obstructing collaterals syndrome, with 101 cases (28.61%). Rheumatic obstruction syndrome accounted for 56 cases (15.86%), while damp-heat obstruction syndrome was identified in 47 cases (13.31%), representing the next most common category. Cold-damp obstruction syndrome was present in 12 cases (3.40%), and other syndrome types comprised 14 cases (3.97%), both constituting relatively low proportions (Table 2).

Table 2 Distribution of TCM syndrome types in inpatients with AS from 2018 to 2024 case

Year	Blood stasis obstructing collaterals	Liver-kidney deficiency	Rheumatic obstruction	Damp-heat obstruction	Cold-damp obstruction	Others
2018	24	8	0	12	8	0
2019	25	26	13	4	3	4
2020	22	16	6	7	0	0
2021	12	24	10	6	0	6
2022	6	19	9	4	1	2
2023	9	11	14	5	0	1
2024	3	19	4	9	0	1
Total//*n* (%)	101(28.61)	123 (34.85)	56 (15.86)	47 (13.31)	12 (3.40)	14 (3.97)

Analyzing the data on an annual basis, the highest number of patients diagnosed with liver-kidney deficiency syndrome was recorded in 2019, with 26 cases. In contrast, 2018 saw a predominance of blood stasis obstructing collaterals syndrome, accounting for 24 cases. The incidence of rheumatic obstruction syndrome peaked in 2023, reaching 14 cases. Additionally, patients with cold-damp obstruction syndrome were primarily concentrated from 2018 to 2019, totaling 11 cases, with a marked decline in the number of such cases observed after 2020.

3.3 Comorbidities of underlying diseases

3.3.1 Overall incidence of underlying diseases. Among the 353 patients, 271 (76.77%) had underlying diseases, while 82 (23.23%) had no clearly identified underlying conditions. The number of patients with underlying diseases peaked in 2021 with 49 cases and reached its lowest point in 2024 with 35 cases, demonstrating an overall trend of initial increase followed by a subsequent decrease (Table 3).

Table 3 Comorbidities of underlying disease in inpatients with AS from 2018 to 2024 case

Year	Present	Absent
2018	38	14
2019	50	25
2020	37	14
2021	49	9
2022	32	9
2023	30	10
2024	35	1
Total//*n* (%)	271 (76.77)	82 (23.23)

3.3.2 Composition of primary underlying diseases. Among the 271 patients with underlying conditions, hypertension was the most prevalent, accounting for 52.77% (143 cases). This was followed by digestive system diseases at 19.93% (54 cases), diabetes at 18.08% (49 cases), and cerebral infarction at 16.61% (45 cases). The prevalence rates of respiratory system diseases/nodules, neuropathy, and heart diseases were 15.50%, 9.59%, and 10.33%, respectively. Thyroid diseases (5.17%) and tumors (6.27%) were observed less frequently (Table 4).

From the perspective of annual distribution, the number of patients diagnosed with respiratory diseases/nodules was the highest in 2024 (25 cases), primarily attributed to the department's enhanced chest imaging screening conducted during 2023 – 2024. The number of patients with hypertension peaked in 2019 (25 cases) and consistently represented the highest proportion among underlying diseases each year.

Table 4 Distribution of primary underlying diseases among inpatients with AS from 2018 to 2024 case

Year	Hypertension	Cerebral infarction	Heart disease	Diabetes	Tumor	Thyroid disease	Respiratory system disease/nodule	Digestive system disease	Neuropathy
2018	19	10	1	10	3	1	0	5	2
2019	25	8	6	9	2	5	2	11	5
2020	23	6	6	7	2	2	1	8	3
2021	21	6	4	6	4	3	0	13	6
2022	20	4	4	4	2	1	2	6	3
2023	17	5	4	4	1	0	12/10	3	2
2024	18	6	3	9	3	2	25/21	8	5
Total//*n* (%)	143 (52.77)	45 (16.61)	28 (10.33)	49 (18.08)	17 (6.27)	14 (5.17)	42 (15.50)	54 (19.93)	26 (9.59)

3.4 Occurrence of organ involvement complications Among the 353 patients, 114 exhibited definitive organ involvement complications, corresponding to an incidence rate of 32.29%. Osteoporosis was the most prevalent complication, affecting 64.91% of these cases (74 patients). This was followed by interstitial lung disease, which accounted for 24.56% (28 patients), and renal insufficiency, representing 10.53% (12 patients) (Table 5). In 2021, the highest number of osteoporosis cases was recorded (16 patients), whereas in 2024, interstitial lung disease cases peaked (7 patients). Renal insufficiency cases were predominantly observed in 2021, with 5 patients affected.

Table 5 Distribution of organ involvement complications in inpatients with AS from 2018 to 2024 case

Year	Interstitial lung disease	Renal insufficiency	Osteoporosis
2018	3	0	4
2019	6	1	12
2020	2	2	11
2021	5	5	16
2022	2	0	15
2023	3	3	7
2024	7	1	9
Total//*n* (%)	28 (24.56)	12 (10.53)	74 (64.91)

3.5 Distribution of concurrent infection types Among the 353 patients, 48 cases involved concurrent infections, resulting in an infection incidence rate of 13.60%. Urinary tract infections constituted the largest proportion of these cases (37.50%, 18 cases), followed by pulmonary infections (33.33%, 16 cases). The proportions of upper respiratory infections (10.42%, 5 cases), intestinal infections (6.25%, 3 cases), and other infections (6.25%, 3 cases) were comparatively lower. The incidence rates of *Helicobacter pylori* infection (4.17%, 2 cases) and gingival infection (2.08%, 1 case) were the lowest (Table 6). In 2021, urinary tract infections were most prevalent, with 6 cases reported, whereas in 2022, pulmonary infections were the most frequent, also with 6 cases.

4 Discussion

Among the 353 inpatients with AS included in this study, the male-to-female ratio was 1.89 : 1, which is slightly lower than the 2 : 1 to 4 : 1 ratio reported in domestic general population epidemiological surveys[1]. This discrepancy may be attributed to the predominance of moderate to severe cases among inpatients: female patients with AS tend to exhibit milder disease that can be managed in outpatient settings, whereas male patients are more likely to experience disease progression necessitating hospitalization.

The primary TCM syndrome types identified were liver-kidney deficiency syndrome (34.85%) and blood stasis obstructing collaterals syndrome (28.61%), which correspond to the core pathogenesis of AS, characterized by "deficiency in origin and excess in superficislity". These findings are consistent with previous

Table 6 Distribution of concurrent infection types in inpatients with AS from 2018 to 2024 case

Year	Upper respiratory infection	Pulmonary infection	Intestinal infection	Helicobacter pylori infection	Urinary tract infection	Gingival infection	Other infections
2018	1	0	0	1	2	0	1
2019	0	2	0	0	1	1	0
2020	0	2	1	1	5	0	1
2021	1	3	0	0	6	0	1
2022	0	6	0	0	1	0	0
2023	0	2	1	0	0	0	0
2024	3	1	1	0	3	0	0
Total//n (%)	5 (10.42)	16 (33.33)	3 (6.25)	2 (4.17)	18 (37.5)	1 (2.08)	3 (6.25)

studies[2-3]. Liver-kidney deficiency is considered the fundamental cause of the disease, while blood stasis obstructing collaterals represents a key symptom in its progression. Furthermore, as the disease advances, the prevalence of liver-kidney deficiency increases, indicating that patients in the middle and late stages predominantly exhibit deficiency syndromes or a combination of deficiency and excess. This observation supports the TCM treatment principle of eliminating pathogenic factors during the early stage and both supporting the body's resistance and eliminating pathogenic factors during the middle and late stages.

A total of 76.77% of the patients presented with underlying diseases, predominantly hypertension, digestive system disorders, diabetes, and cerebral infarction, indicating a high prevalence of multi-system complications among individuals with AS. The elevated incidence of cardiovascular, cerebrovascular, and metabolic conditions is attributable to the predominance of male patients in the cohort. Additionally, the increased occurrence of digestive system diseases is likely related to mucosal damage resulting from prolonged use of NSAIDs and DMARDs, as well as compression of abdominal organs caused by thoracic-lumbar kyphotic deformity[4]. These findings align with the conclusions of Hu Lifang *et al.*[5], who reported a high incidence of metabolic diseases in male patients.

The incidence of infection was 13.6%, predominantly comprising urinary tract infections (37.5%) and pulmonary infections (33.3%). These findings align with the epidemiological profile of patients with chronic diseases who exhibit lower immune function, thereby offering a clear focus for clinical infection prevention and control strategies. The incidence of organ involvement complications was 32.29%, with osteoporosis accounting for 64.91% of these cases, ranking first. This finding is generally consistent with the reported prevalence rates of 19% -61% in both domestic and international studies[6-7]. The underlying mechanism is associated with the activation of osteoclasts induced by pro-inflammatory cytokines such as TNF-α and IL-1[8]. Interstitial lung disease accounted for 24.56% of cases; although detection rates varied compared to some studies[9], potentially due to differing inclusion criteria, both sets of findings indicate that pulmonary involvement is a common complication of AS, warranting early screening via chest HRCT. Renal insufficiency was observed in 10.53% of cases; despite its relatively low incidence, vigilance is necessary regarding drug-induced kidney injury and interstitial inflammation related to the disease itself.

In summary, inpatients with AS are characterized by a predominance of males, a TCM syndrome type of deficiency in origin and excess in superficislity, and a high prevalence of underlying diseases and multiple organ complications. Clinical diagnosis and treatment should aim to balance the management of the primary disease with the prevention and control of complications. Individualized treatment plans should be developed based on TCM syndrome types. Additionally, monitoring of bone density, chest HRCT, liver and kidney function, as well as blood pressure and blood glucose levels, should be integrated into the chronic disease management system to support optimization of treatment strategies and improve patient prognosis.

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